


**EFFECT OF GLOBAL OIL PRICE VOLATILITY AND EXCHANGE RATE POLICY ON  
FOREIGN EXCHANGE RESERVES IN IRAQ**

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ARTICLE INFO	ABSTRACT
<p><b>Article history:</b></p> <p><b>Received</b> 01 May 2023</p> <p><b>Accepted</b> 27 July 2023</p>	<p><b>Purpose:</b> This paper offers simulations and forecasts of the ideal currency reserve measure in light of future shocks to the Iraqi economy due to the downturn in the international price of oil and the global economic shutdown triggered by the Corona pandemic.</p>
<p><b>Keywords:</b></p> <p>Blended Learning; Management Education; Executive Education; Bibliometric Analysis; Management; Business Education.</p> <div data-bbox="172 981 480 1227" style="text-align: center;">  </div>	<p><b>Theoretical framework:</b> The Iraqi foreign exchange reserves have entered a cycle of sustained and accelerated degradation in recent years and hit alarming amounts in 2020, affecting Iraq's financial stability compared to other foreign currency reserves. According to figures from the Iraqi Parliament's Financial Commission, the Iraqi fund in the Central Bank of Iraq decreased, following removing the government's second loan by the end of 2020, to \$35 billion. The Fitch Ratings Agency, on the other hand, has found that Iraq's plan to slash public sector wages and pension costs will delay the reduction of currency reserves as part of the attempt to lower financial imbalances and relieve financial pressures. However, it will be difficult to enforce and risk exacerbating social disorders. According to Fitch, by the end of August (15% of projected GDP for 2020), cash funding from the Central Bank of Iraq grew to 28.5 billion Iraqi dinars from 14.1 billion Iraqi dinars at the end of May.</p> <p><b>Design/methodology/approach:</b> The study uses an analytical approach to show the fluctuations in oil prices and their impact on the fluctuation of oil revenues and the currency-selling window that the Central Bank of Iraq applies to its foreign reserves.</p> <p><b>Findings:</b> The systemic problem of worldwide petroleum price drops that provide longer-term estimates to estimate the decrease in petroleum prices on global oil markets explains the quick fall in Iraqi exchange reserve magnitude. Iraq's foreign reserves, mostly from oil exports, fulfill international standards. Iraq's exchange rate policy depends on the Central Bank's direct foreign currency sales. This approach reduces foreign money diversion from Iraq, preventing the central bank from maintaining exchange rate stability.</p> <p><b>Research, Practical &amp; Social implications:</b> The impact of foreign reserves on national financial stability is becoming more obvious as their function evolves from supplying fundamental transaction needs to fulfilling financial security criteria.</p> <p><b>Originality/value:</b> The Iraqi dinar's value must be protected at all costs, hence the Central Bank of Iraq's foreign reserves are crucial. These reserves are affected by oil revenues, the main financier for it, and the window for selling the currency, which is the outlet for leakage from it.</p> <p>Doi: <a href="https://doi.org/10.26668/businessreview/2023.v8i8.3394">https://doi.org/10.26668/businessreview/2023.v8i8.3394</a></p>

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## EFEITO DA VOLATILIDADE GLOBAL DOS PREÇOS DO PETRÓLEO E DA POLÍTICA CAMBIAL SOBRE AS RESERVAS CAMBIAIS NO IRAQUE

### RESUMO

**Objetivo:** O presente documento apresenta simulações e previsões da medida de reserva de divisas ideal à luz de futuros choques para a economia iraquiana devido à queda do preço internacional do petróleo e ao encerramento da economia mundial desencadeado pela pandemia de Corona.

**Quadro teórico:** As reservas cambiais do Iraque entraram em um ciclo de degradação sustentada e acelerada nos últimos anos e atingiram valores alarmantes em 2020, afetando a estabilidade financeira do Iraque em comparação com outras reservas de moeda estrangeira. De acordo com dados da Comissão Financeira do Parlamento iraquiano, o fundo iraquiano no Banco Central do Iraque diminuiu, após remover o segundo empréstimo do governo até o final de 2020, para US\$ 35 bilhões. A Agência Fitch Ratings, por outro lado, descobriu que o plano do Iraque de reduzir os salários e os custos das pensões do setor público atrasará a redução das reservas de moeda como parte da tentativa de reduzir os desequilíbrios financeiros e aliviar as pressões financeiras. No entanto, será difícil aplicá-la e corre o risco de exacerbar as desordens sociais. De acordo com a Fitch, até o final de agosto (15% do PIB projetado para 2020), o financiamento em dinheiro do Banco Central do Iraque cresceu para 28,5 bilhões de dinares iraquianos de 14,1 bilhões de dinares iraquianos no final de maio.

**Projeto/metodologia/abordagem:** O estudo utiliza uma abordagem analítica para mostrar as flutuações nos preços do petróleo e seu impacto na flutuação das receitas do petróleo e na janela de venda de divisas que o Banco Central do Iraque aplica às suas reservas externas.

**Constatações:** O problema sistêmico das quedas dos preços do petróleo em todo o mundo que fornecem estimativas de longo prazo para estimar a queda nos preços do petróleo nos mercados globais de petróleo explica a queda rápida na magnitude da reserva de câmbio iraquiana. As reservas externas do Iraque, principalmente as provenientes das exportações de petróleo, cumprem os padrões internacionais. A política cambial do Iraque depende das vendas diretas de moeda estrangeira do Banco Central. Esta abordagem reduz o desvio de moeda estrangeira do Iraque, impedindo o banco central de manter a estabilidade cambial.

**Investigação, implicações práticas e sociais:** O impacto das reservas externas na estabilidade financeira nacional está a tornar - se mais óbvio, à medida que a sua função evolui do fornecimento de necessidades fundamentais de transação para o cumprimento de critérios de segurança financeira.

**Originalidade/valor:** O valor do dinar iraquiano deve ser protegido a todo custo, portanto, as reservas externas do Banco Central do Iraque são cruciais. Essas reservas são afetadas pelas receitas do petróleo, o principal financiador, e a janela para a venda da moeda, que é a saída para vazamentos a partir dela.

**Palavras-chave:** Aprendizagem Combinada, Educação em Gestão, Educação Executiva, Análise Bibliométrica, Gestão, Educação Empresarial.

## EFFECTO DE LA VOLATILIDAD MUNDIAL DE LOS PRECIOS DEL PETRÓLEO Y DE LA POLÍTICA CAMBIARIA SOBRE LAS RESERVAS DE DIVISAS EN EL IRAQ

### RESUMEN

**Propósito:** Este trabajo ofrece simulaciones y pronósticos de la medida ideal de reserva monetaria a la luz de los futuros shocks para la economía iraquí debido a la caída del precio internacional del petróleo y el cierre económico global provocado por la pandemia de Corona.

**Marco teórico:** Las reservas de divisas iraquíes han entrado en un ciclo de degradación sostenida y acelerada en los últimos años y alcanzaron cantidades alarmantes en 2020, afectando la estabilidad financiera del Iraq en comparación con otras reservas de divisas. Según cifras de la Comisión Financiera del Parlamento iraquí, el fondo iraquí en el Banco Central de Irak disminuyó, luego de eliminar el segundo préstamo del gobierno para fines de 2020, a 35.000 millones de dólares. Por otra parte, la Fitch Ratings Agency ha llegado a la conclusión de que el plan del Iraq de reducir drásticamente los salarios del sector público y los costos de las pensiones retrasará la reducción de las reservas monetarias como parte del intento de reducir los desequilibrios financieros y aliviar las presiones financieras. Sin embargo, será difícil hacer cumplir la ley y se corre el riesgo de exacerbar los trastornos sociales. Según Fitch, a fines de agosto (15% del PIB proyectado para 2020), el financiamiento en efectivo del Banco Central de Irak creció a 28.500 millones de dinares iraquíes de 14.100 millones de dinares iraquíes a fines de mayo.

**Diseño/metodología/enfoque:** El estudio utiliza un enfoque analítico para mostrar las fluctuaciones de los precios del petróleo y su repercusión en la fluctuación de los ingresos del petróleo y la ventana de venta de divisas que el Banco Central del Iraq aplica a sus reservas de divisas.

**Hallazgos:** El problema sistémico de las caídas mundiales de los precios del petróleo que proporcionan estimaciones a más largo plazo para estimar la disminución de los precios del petróleo en los mercados mundiales del petróleo explica la rápida caída de la magnitud de las reservas de divisas iraquíes. Las reservas de divisas del

Iraq, en su mayoría procedentes de las exportaciones de petróleo, cumplen las normas internacionales. La política cambiaria del Iraq depende de las ventas directas de divisas del Banco Central. Esta estrategia reduce el desvío de dinero extranjero desde Irak, impidiendo que el banco central mantenga la estabilidad del tipo de cambio.

**Repercusiones sociales, prácticas y de investigación:** El impacto de las reservas de divisas en la estabilidad financiera nacional es cada vez más evidente a medida que su función evoluciona desde satisfacer las necesidades fundamentales de las transacciones hasta cumplir los criterios de seguridad financiera.

**Originalidad/valor:** El valor del dinar iraquí debe protegerse a toda costa, por lo que las reservas de divisas del Banco Central de Iraq son cruciales. Estas reservas se ven afectadas por los ingresos del petróleo, el principal financiador de la misma, y la ventana para vender la moneda, que es la salida para las fugas de la misma.

**Palabras clave:** Aprendizaje Mixto, Educación en Gestión, Educación Ejecutiva, Análisis Bibliométrico, Gestión, Educación Empresarial.

## INTRODUCTION

The Iraqi foreign exchange reserves have begun a cycle of prolonged and rapid decline in recent years and are projected to reach worrying levels in 2020, threatening the country's financial stability relative to other foreign currency reserves. Following the elimination of the government's second loan by the end of 2020, the Iraqi money at the Central Bank of Iraq reduced to \$35 billion, as reported by the Iraqi Parliament's Financial Commission. In contrast, the Fitch Ratings Agency has determined that Iraq's strategy to reduce public sector pay and pension expenditures would postpone the decline of currency reserves in an effort to reduce financial imbalances and alleviate financial pressures. However, it will be challenging to implement and may exacerbate social difficulties. According to Fitch, cash support from the Central Bank of Iraq increased from 14.1 billion Iraqi dinars at the end of May to 28.5 billion Iraqi dinars by the end of August (15 percent of the expected GDP for 2020). However, it remains steady while the administration seeks parliamentary approval for extra borrowing. Given their dependence on imports and the fixed exchange rate, Iraq's large budget deficit is reflected in the current account deficit, which strains foreign currency reserves, especially in the absence of external finance flows. Despite apparent increases and decreases over the previous two years, the performance is still satisfactory. Foreign currency reserves are an integral component of a government's foreign reserves. The country's import-export needs will be satisfied, its foreign debt will be serviced, its balance of payments will be preserved, its currency's value will be safeguarded, and its financial stability will be ensured. Since the 1960s, the moderate currency reserve scale has been the subject of increased research both domestically and internationally. Positive results were found using both quantitative and qualitative approaches to the study of the optimal foreign exchange balance scale. Never before has there been so much worry about the worldwide repercussions of a financial crisis. Therefore, the Devices Reserves are essential in mitigating and protecting the company from

any future monetary losses. Its importance is increasingly being recognized all throughout the world. Because of this, the phrase now has a completely different meaning. The theoretical subject of how best to use currency reserves to minimize financial risks and identify the right amount of a financial stability departmental reserve is gaining steam at the same time in the United States and throughout the globe. The three major pillars of successful management of foreign exchange reserves are to manage their amount, choose an appropriate currency structure, and make strategic use of asset structure. The basis and assumption for the reserve's strength are two of the three criteria that accurately define the quantity of a foreign currency reserve. For the same reason, Iraq's large foreign currency reserves would be more at risk. Since the function of foreign currency reserves is evolving from satisfying essential transaction needs to satisfying financial protection requirements, the optimum analysis of foreign exchange reserves is of enormous theoretical and practical relevance. To that end, the foreign exchange reserve is included in the definition of national financial reserves. To ensure fiscal stability, we provide a specification of an optimization approach for pinpointing the optimal size of the country's foreign currency reserve. Using data collected in Iraq, we can make educated guesses about the values of the model's most important parameters. We calculate the optimal size of a country's foreign exchange reserves using simulation and risk analysis. Then we may be more flexible in how we formulate our suggestions and responses. The key distinctions stated in this article were influenced by recent research. The perspective used in this investigation is fresh. A country's foreign currency reserves are useful for monetary policy purposes. To meet the requirements of global commerce and economic stability. We offer an optimal size for the Iraq Devises Reserve, taking into consideration the several functions that reserves fulfill. This study goes beyond other previous ones on foreign reserves, which have focused on demand. Combining analytical and computational approaches for maximum effect. In order to create a theoretical assessment of the foreign currency reserve based on financial stability, this research introduces a technique for assessing utility maximization using a cross-term consumer model. It examines the ideal size of Iraq's foreign currency reserves, addressing the shortcomings of previous studies that relied only on theory or empirical investigation. Furthermore, this article gives a clear and focused strategy for managing the foreign-exchange reserve department, and it produces a more intuitive and optimum size for the reserve, making it simpler to monitor. We will give considerable thought to a variety of estimating strategies. The reserve feature analysis method is used in this study, and the cost-benefit analysis framework is enhanced as a result.

By estimating the optimal size of the reserve within restrictions, the proposed technique yields more reasonable estimations of the exchange reserve and more precise conclusions.

## LITERATURE REVIEW

The analysis of foreign currency reserves is a field with a deep and varied history on a global scale. The Devises Reserve's original function was to guarantee a steady supply of domestic currency, while foreign reserve holdings were gold and sterling in conformity with the gold standard. Without including aspects like free exchange and foreign spending, the global reserve research is incomplete. With the end of World War I, countries began restricting the unrestricted export of gold, which led to wildly changing exchange rates and a surge in international commerce as the traditional gold standard progressively collapsed (A. H. Almagtome, Al-Yasiri, Ali, Kadhim, & Heider, 2020). Research on the optimal size of a country's foreign reserve peaked in the 1970s, whereas in the 1960s the emphasis was on the intermediate level. The core idea was a quantitative or qualitative assessment of the whole size of a country's foreign exchange reserves. The essential role of foreign currency reserves in preventing external capital effects was increasingly incorporated into the principle of the optimal size of the foreign currency reserve as international finance, including international acquisitions and borrowing, grew in the 21st century and global financial crises increased. Methods that are often used to evaluate a very modest cash reserve include:

The first solution is a ratio examination of models for assessing the moderate degree by converting the foreign currency reserve into one of the most prominent open economy indicators, such as import-export value, debt, or foreign-output ratio. In its study, Triffin (1978) emphasized that the link between a nation's foreign currency reserve and the import-export value of its commerce should not go below a certain 20% ceiling. Another important criterion is that a nation's foreign currency reserves should cover its import volume for three months. The "Triffin ratio" has become a global indicator of adequate foreign currency reserves. A. Almagtome, K. Khaghaany, and E. Once, (2020), the general ratio analysis technique became crucial in the philosophy of the currency reserve and was included into the corresponding theory of succeeding researchers. The "Greenspan-Guidotti Law" states that a country's exchange reserve should equal a certain proportion of its total short-term foreign debt. The amount of the international fund must be larger than the country's total outstanding foreign debt, including both short- and long-term debt with maturities within a year. There has been a significant increase in the number of scholarly articles devoted to the analysis of ratio reviews in recent



years. By comparing the reserve's size to the country's GDP, as proposed by Jeanne and Ranciere, the utility-maximization approach may be utilized to calculate the optimal foreign exchange reserve. (2011). There are several advantages to doing a ratio analysis, including the fact that the optimum solution is a near approximation and that analytical data and analysis may be gathered for a single location. The negative is that because just one factor is taken into account, the impact of other economic factors on the FX reserve is overestimated.

Heller proposed a cost-benefit analysis as the alternative method. (1966). Its core premise is that a country's optimal level of foreign exchange reserves may be determined by striking a balance between its marginal earnings and marginal expenditures. This strategy shifts the focus of success away from monetary gain and toward some other value or set of values. Foreign currency reserves, the cost of overseeing abroad assets, and the price of resolving global imbalances were all factors that Heller considered. These three criteria may be used to assess whether or not an area has sufficient access to external resources. Agarwal (1971) modified Heller's model to account for the economic and institutional differences between developing and industrialized nations. He argued that advanced economies need foreign currency to maintain their current account balances, to finance foreign capital purchases, and to make the concept of somewhat large foreign reserves attractive to developing nations. This method is used by Iraqi academics as a starting point for their limited research on Iraq's foreign cash reserves.

The third tactic is a regression study that looks at the reserve function. This method is simpler than the cost-benefit analysis in terms of both comprehension and application. In order to determine the optimal size of the foreign exchange fund and the production of foreign currency reserves, this model takes into account a number of factors related to the need for such reserves, generates a model for the relevant parameters for regression factors, and makes use of critical variables. Flanders (1971) proposed reserve function analysis, and subsequent economists like Frenkel (1974) and Iyoha (1985) refined and expanded upon the idea. (1976). Frenkel built a logarithmic model using the following three variables: payment balance, international trade size, and typical import patterns, and then utilized statistics to estimate parameter values. Thanks to the dynamic demand feature supplied by Iyoha's research for developed nations and the incorporation of import rate variables, foreign currency reserves may be assessed in light of expected exports and first- and second-order lag investments. Iyoha's study therefore revealed the cost of variable production. A 10% increase in a country's holding reserve would need a 9% increase in its foreign currency reserves.

Combining these three quantitative approaches with a qualitative study based on language and content may provide the most accurate assessment of the foreign currency reserve scale. Changes in the macroeconomic indicators of that nation and the macroeconomic influence on those variables are used by the qualitative system to determine the foreign currency balance. When it comes to economic policy, moderation is essential. Changes in economic indicator indices should be natural if the country's macroeconomic policy is solid and the quantity of currency reserves is appropriate. Based on government policy, the consistency of the country's international solvency regime, the effectiveness of the country's international payments balance adjustment process, economic conditions, and the effectiveness of the country's international payments balance adjustment process, a country should establish a content reserve, as stated by Carbaugh and Fan (1976). Qualitative research has the advantage of being adaptable to the present status of a country's international economic activity and may be assessed on an intuitive level. Therefore, a first evaluation of macroeconomic policy is required. These characteristics can't be measured, which is a downside. If the factors are not normally distributed around a mean value of foreign reserves, then the ranking of countries' currency reserves cannot be examined or analyzed scientifically.

The likelihood of money movements across borders increased during the 21st century, prompting policymakers to determine the optimal level of foreign currency reserves. The primary purpose of a country's foreign currency reserves, at least in industrialized nations, was to guarantee a steady inflow of foreign cash and economic stability. After the Asian financial crisis, industrialized nations' foreign currency reserves climbed by an average of almost 60% annually. Self-insurance as an incentive for retaining excess foreign currency reserves was studied by Mendoza (2004), who also examined its policy impacts in 65 industrialized nations. According to Aizenman and Lee, nations in East Asia with substantial foreign accounts like Iraq, Japan, and South Korea might be a monetary symptom of commodification. (2007). The majority of Iraq's foreign currency reserves are stored in East Asian nations, thus this growth is encouraging for the country's ability to keep its exchange rate, commerce, and banking system stable. Experts throughout the world have been more creative in their study of localized currency reserves in recent years.

They also tracked the growth or decline in foreign currency reserves held by developing countries beginning in 1998. Their findings indicate that the coefficient of risk aversion in developing economies, particularly in eastern Asia, has risen sharply. An increase in foreign currency reserves has also been made to assist ease any crisis. Because of the interruptions in

the past that unexpectedly halted capital inflows and hurt local output and expenditures, new methods and a new way of thinking about operating a business have emerged. During the global financial crisis of 2008-2009, foreign currency reserves served as a "absorbent," according to research by Aizenman and Hutchison (2012). Aizenman, Edwards, and Riera-Crichton argue that foreign currency reserves may have cut manufacturing prices during the 2008-2010 financial crisis. (2012). Small foreign exchange reserves built up by a central bank may help spread the costs of inflation over time, says Pina (2015), even if large foreign currency reserves are destructive to the economies of industrialized nations. The research by Cova, Pagano, and Pisani (2014) confirms the importance of protecting one's wealth in foreign currencies and the "extravagant privilege." Pina (2017) examined the connection between foreign exchange reserves and global interest rates and found that these reserves would be affected by fluctuations in exchange rates.

Research on Iraq's meager foreign exchange reserves often use models and assumptions about the degree to which the Iraqi economy is accessible to foreign trade and investment. This article divides Iraqi educational resources into three categories: inadequate, sufficient, and excessive. As a result of the lost scale impact, it is speculated that Iraq does not have sufficient foreign assets. Few academics have come to this view in recent years (Liu, 2003) [17,18], and as international objections have increased, the voices of those who contend that they are insufficient have been lost in the noise. Existing foreign currency reserves in Iraq are adequate. (G.-J. Wang, Feng, Xiao, Zhu, & Xie, 2022). As a consequence of Iraq's growing trade reserves over the last several years, the country's economists have calculated a surplus of X magnitude. Wang, Li, and Ren, please pay attention to this. (2022).

Using forecasts of future demand, Xiao (2020) modified the Agarwal model to better categorize Iraq's foreign exchange market into six distinct subsets. He then deduced that, as of 2004, Iraq's foreign currency reserves had exceeded the whole exchange reserve scale. This surplus reserve is the result of adjustments made to Iraq's required foreign exchange reserves to assist maintain market and currency rate stability. Focusing on Iraq and the other BRICS (Brazil, Russia, India, South Africa, and Iraq) countries, Xiao (2020) made his points. Foreign cash reserves were found to be moderate in South Africa and India, but insufficient in Iraq, Russia, and Brazil. Then, emerging market nations may be ranked based on how they utilise their foreign reserves. The exchange rate is now Jiang Boke and Ren Fei's top priority. (2013). A double equilibrium model is used to determine the optimal size of a country's foreign exchange reserves. Gong, Guan, Chen, Liu, and Fu demonstrate that the effects of a really



efficient exchange rate on the size and composition of a country's foreign currency reserves are asymmetrical and nonlinear. (2021). To determine the optimal level of foreign currency reserves for Iraq, Zhou, Yan, and Luo (2018) used the Open Conditional DSGE model to the country's economy. (Dynamic Stochastic General Equilibrium). Based on the numbers, it seems that Iraq's foreign currency reserves have been at a perfect level for making international payments since 2004.

Researching the optimal split between domestic and international investments is, thus, a useful endeavor. Massive improvements are seen all through this evaluation. Recent studies in other fields, however, have focused mostly on the national level. (such as emerging market countries, although some studies also include Iraq). While comparative studies are useful for understanding why a certain amount of foreign reserves is best for nations with similar economies, they typically overlook the unique aspects of the countries under investigation. It would be difficult to find the optimal exchange rate if it were based on features that were constant between nations. Still not very convincing, especially with regards to Iraq.

But Iraq has done extensive research on the best way to manage its foreign exchange reserves. But most of their studies have focused on finding the appropriate quantity of exchange reserves based on demand, rather than investigating the optimal size of its foreign reserves from the standpoint of financial stability and financial risk. As a result, foreign currency reserves' principal purpose switched from ensuring a transaction's financial soundness to doing only little analysis as its importance expanded. (Khaghaany, Kbelah, & Almagtome, 2019). The purpose of this article is to introduce the concept of the optimal currency reserve from the perspective of financial stability, with an emphasis on efficiency maximization in light of the impact of the unexpected stoppage of capital inflows into Iraq. This study updates the methodology previously used to determine the optimal size of Iraq's foreign currency reserves.

## **THEORETICAL MODEL**

It is based on data and is calculated from the amount of ideal foreign exchange reserves. In order to assess whether or not a country has an adequate amount of foreign cash on hand. This item is based on research conducted using the framework developed by Jeanne and Rancière. (2011). The model employs the maximizing utility principle and the three-period model as a buffer mechanism to reduce the impact of an abrupt halt in capital flow on domestic absorption and the balance of payments. The cost of maintaining foreign reserves is increased by holding onto substantial amounts of foreign currency assets that are worth less than the interest rate profits. Under cost constraints and utility functions, the

ratio of foreign exchange reserves to GDP is used to determine optimal debt levels, along with seven other observable factors: the probability of capital stoppage, economic growth rate, risk-free interest rate, risk aversion coefficient, time premium, production loss rate, and the short-term external debt-to-output ratio.

### Hypothesis Development and Model

Production of  $Y_t$  may be seen as domestic absorption on TBT balance sheets, which makes sense in the context of the emerging market's relatively closed economy. In this sense, we might define housing demand as:

$$A_t = Y_t - TB_t \quad (1)$$

The international balance of payments can be specified as the balance  $TB_t$  of the commercial account as the reverse variable capital, the balance  $KA_t$  of the financial account, as well as foreign revenue and transfer payments  $IT_t$ , and the amount of the exchange sum =  $R_t$  of the current foreign currency reserves. All of these components make up the international balance of payments.

$$TB_t = -KA_t - IT_t + \Delta R_t \quad (2)$$

Foreign absorption may also be depicted as a result of gross production, capital and financial account balances, sales and transfer payments from abroad, and changes in international reserves in the parallel estimation of the (1) and (2) equations for the current cycle:

$$A_t = Y_t + KA_t + IT_t - \Delta R_t \quad (3)$$

This equation illustrates the mechanism of variables that are connected to the natural flow of resources in an economy that is free to competition. (3). Then, we explore the adjustment of the vector mechanism under the crisis scenario, and we discover that domestic absorption would decrease as the K.A. account dropped owing to the sudden suspension of capital inflows. This conclusion was reached after we conducted research on the adjustment of the vector mechanism under the crisis scenario. Because production  $Y$ , the capital account, and the finance account K.A. are all going in the same way, the domestic absorption would be

worsened by the impact of the capital halted on output. This is due to the fact that production  $Y$ , the capital account, and the finance account  $K.A.$  are all moving in the same direction. As the effect of the next stop on domestic absorption of capital inflows, particularly the adjustment of the capital stock to a negative value and the absorption of foreign exchange reserves, develops, the current strategy of the government is to deploy currency reserve decreases as a countermeasure. This is because the adjustment of the capital stock to a negative value and the absorption of foreign exchange reserves will absorb foreign exchange reserves. It is essential to keep in mind that the government must maintain foreign currency reserves in order to secure its international debt, which makes it difficult to make payments in the event of an unexpected interruption of funding. After experiencing a dramatic decline in capital inflows during period  $t-1$ , the ratio of financial equilibrium to real GDP output saw a dip of more than five percentage points.

Nation during the  $t$  era. Namely, in defining  $k_t = KAt / Yt$ ,  $k_{t-1} - k_t > 5$  percent plus a sudden cessation of capital inflows in the  $t$  era is regarded.

We are likewise addressing a free-market economy with consumption both at home and overseas, but with certain constraints, in the discrete time span  $t = 0, 1, 2$ . In terms of actual exchange rate fluctuations, the only potential external shock to the economy is the possibility of a sudden halt in capital inflows. It is essential for the export-growth path the economy is on, and without it, the economy would fail. The domestic economy may be broken down into the public sector and the private sector. Consider the following hypothetical private sector client:

$$C_t = Y_t + L_t - (1+r)L_{t-1} + Z_t \quad (4)$$

Abbreviations for these phrases include "current investments," which is abbreviated as " $C_t$ ," "current foreign debt," which is abbreviated as " $L_t$ ," and "outstanding foreign debt," which is abbreviated as " $L_{t-1}$ ." It is an abbreviation for the Budget Swap Levy, which is an agreement between the government and the people who make up the government that guarantees the people who make up the government financial compensation in the event that the government is unable to service its external debt and hence reduces their reserves of foreign currency. When referring to the short-term value of  $r$ , we make use of the phrase "constant." In the event that there is no default on external loans, the actual spending expenditure will be equivalent to the current cycle's cumulative output minus any resources

that are left over after servicing the debt from the current period as well as debt from previous periods ( $Y_t + L_t(1+r) - L_{t-1}$ ) and any subsidies from government contingency contracts. ( $Z_t$ ).

It is anticipated that both the private and public sectors of the economy would expand so long as regular monetary flows are maintained in the economy. However, when there is no longer any incoming capital, there is an immediate halt to the expansion. If capital inflows abruptly dry up, which might lead to a reduction in global output, then it is possible that international debt will not be able to be paid off within the current economic cycle. The flow of cash into the company will come to a stop if either the representative customer defaults on the existing overseas loan or output  $Y$  has declined considerably in comparison to its long-term development path.

Let's say the customer doesn't owe any money to any international organizations on a long-term basis. If consumers are concerned about the possibility of losing their money, they will not be interested in investing in foreign markets. The production continues to vary from the intended growth pattern, and the ratio has reduced as a consequence of the loss of income from the new foreign loan  $L$ . This is due to the fact that the ratio was originally calculated before the loss of revenue from the new foreign loan  $L$ . Since the end of the financial crisis, the income from foreign debt has remained at zero, and production in sector  $Y$  has resumed its historical course of long-term increase. It is assumed that there will be a cutback in the amount of money spent on capital expenditures. Since the flow of capital came to a standstill, the economy has expanded at a rate that is slower than the risk-free rate for the short term, which is denoted by  $r$ .

Assuming this crisis only occurs once, we may think of  $b$ ,  $d$ , and  $a$  as three distinct cycles that occur before, during, and after the sudden end of monetary circulation.  $b$  reflects the level of external debt as a percentage of GDP at pre-crisis levels;  $= L_t/Y_t$ . Therefore:

$$\begin{aligned} \text{Before the crisis, } Y^b &= (1 + g)^t Y_0; L^b = \lambda(1 + g)^t Y_0 \\ \text{At the time of the crisis, } Y^u &= (1 - \gamma)(1 + g)^t Y_0; L^u = 0 \\ \text{After the crisis, } Y^u &= (1 + g)^t Y_0; L^u = 0 \end{aligned}$$

The current condition of things in the public sector is the primary subject of the first section of our research. As opposed to private investors, governments have the ability to buy long-term foreign debt that does not need immediate repayment in the event that there is a capital freeze. Bonds issued by the government accrue interest in the form of a proportional

share of the nation's output until the sudden termination of the capital, at which point the bonds' interest payments end completely. Because of the low possibility of an unexpected stoppage in the flow of money and the comparatively large value of a 1/ term, the maturities of government bonds need to be rather long in order to compensate for the non-payment of short-term foreign debt incurred by the private sector. If the number were 0.1, it would mean that there is a 10% probability that government bonds will still be in existence after 10 years. Before the unexpected closure, the price of a government bond may have been equivalent to the discount value of the unit asset that the bond would have to pay for throughout the subsequent period, in addition to the bond's actual market value.

When determining the value of one unit of a commodity against another. Regardless of whether or not there is a gap between periods,  $1+r+\delta+\pi$  represents the inevitable recurrence of the payment cycle.

There has to be an estimate of the bond market's expected average value. Long-term bond prices are expected to stay stable until the capital freeze takes effect. If capital is suddenly cut off, its value will plummet to nothing; thus, the projected value must take this possibility into consideration, at which point it will be worth exactly what was originally predicted.:

Therefore:

$$\frac{1}{1+r+\delta+\pi} [(1-\pi) \cdot P]$$

And the following was solved:

$$\frac{1}{1+r+\delta+\pi} [1+(1-\pi) \cdot P]$$

$$P = \frac{1}{r+\delta+\pi}$$

The long-term and short-term interest rate gap occurs when the interest rate used to determine the present value of long-term bonds is higher than the short-term interest rate.

Since the government was unable to issue short-term bonds due to capital arrest, long-term bonds were issued to finance overseas investments. Up until the money ran out, the foreign exchange reserves had to rely on long-term bonds to accumulate foreign currency. Foreign exchange reserves are calculated as follows, where  $N_t$  is the total number of long-term government bonds issued during period  $t$ :

$$R_t = PN_t; R_{t-1} = PN_{t-1} \tag{5}$$



To have a balanced budget prior to the capital freeze is indicative of a government that is constrained in its spending:

$$Z_t + R_t + N_{t-1} = P(N_t - N_{t-1}) + (1+r)R_{t-1} \quad (6)$$

On the left side of equation (6), which represents the government's total expenditures for the time, are the terms transfer payments to representative customers, the value of goods due to be returned from the preceding period, and the needed foreign currency reserves for the current period. Getting the gross turnover of the present state from the right-hand side of the equation requires taking into account the current borrowing duration, the net income from the redemption of the principal of the matching long-term bond, and the value of the currency reserves held by t-1 in the current period. (9). To get around the government-subsidized transfer payment period Z for the representative user, you must first guarantee that consumption demands will be met before the abrupt halt by applying equation (5) and replacement in conjunction with equation (6):

$$\tau_t^b = -\frac{1}{\pi}(\delta + r)R_{t-1} = -(\delta + \pi)R_{t-1} \quad (7)$$

Equation (7) illustrates that the transfer charge will be less than zero if the transaction takes place before a capital ceasefire. Taking into consideration the resource's time premium and the possibility of a capital truce, the government, which maintains the reserve without using any of the resource itself for the purpose of doing so, levies this tax on the representative user in order to balance the costs associated with maintaining the reserve. The government will utilize its whole net foreign currency asset stock from the previous cycle to subsidize the customer and assist them in paying down their non-deferrable, short-term international debt when capital is limited and taxes are collected. The end result is the following exchange rate:

$$\tau_t^b = (1 - \delta - \pi)R_{t-1} \quad (8)$$

Given  $\delta + \pi < 1$ , contributions are optimistic values in a capital shut down, so the government subsidizes customers.

When the government makes the gesture of pointing  $R_t$  with foreign exchange money and  $Z_t$  with transfer payments, the dealings come to a halt. After an abrupt shutdown of capital, the total amount of long-term bonds available is reduced to zero,  $N$ .

Budgetary restrictions in the domestic market are addressed before, during, and after the capital stop by substituting Equations (7) and (8) for the transfers  $Z_t$  of Equation (4).

$$\dot{r}_t = Y_t + L_t - (1+r)L_{t-1} - (\delta + \pi)R_{t-1} \tag{9}$$

$$r_t = (1 - \gamma)Y_t - (1+r)L_{t-1} + (1 - \delta - \pi)R_{t-1} \tag{10}$$

$$r_t = Y_t \tag{11}$$

Equations (9) and (10) will demonstrate two aspects of the compromises that are required when determining the optimal level of foreign currency reserves. (10). enhanced C domestic consumption during the capital hold phase of  $R_{t-1}$  foreign currency reserves. It also has the effect of lowering the amount of consumption inside the country. (taxes customers pay to reduce the expense of keeping excess foreign exchange reserves). The buildup of currency reserves may be akin to an insurance mechanism, as it would transfer part of the purchasing power under the continuous flow of capital to the state of the capital shutdown in order to compensate for reduced domestic demand. This would be done in order to protect against the possibility of a currency crisis.

In order to get the closed solution for the optimum foreign currency reserve, it is necessary for us to take into account the restricting constraint that is associated with the objective impact function of the government. Because doing so is compatible with the idea of social justice, in our opinion, the government ought to make it a priority to work toward enhancing the quality of life of individuals such as this average client. As a result, any capital that is stopped suddenly will be eligible for the advantageous function and discount after the application of the gain feature to the  $t$  span.

$$U = \sum_{s=0, \dots, +\infty} (1+r)^{-s} u(C_{t+s}) \tag{12}$$

The utility function has a relative coefficient of risk aversion that remains constant over time; the more risk-averse a consumer is, the greater the welfare benefit related to consumption.

$$u(C) = \frac{C^{1-\sigma}}{1-\sigma} \quad (13)$$

By combining the spending restrictions of the typical consumer with those of the government, as shown in Equations (4) and (6), we derive the following formula:

$$C_t = Y_t + (L_t - PN_t) - (1+r)(L_{t-1} - PN_{t-1}) + PN_t - (1+r+\delta+\pi)PN_{t-1} \quad (14)$$

By equating a consumer's nonrenewable short-term commitment  $L$  to the government's longer-term debt  $P.N.$ , Eq. (14) shows that a country's foreign currency reserve  $R$  is proportional to its overall foreign debt. Keeping foreign exchange reserves within the total expenditure limit is similar to issuing long-term bonds to make up for the government's short-term external debt, which a normal customer would be unable to pay in the case of a sudden suspension. Short-term foreign debt has a higher chance of being repaid, but long-term foreign debt is connected with higher holding costs.

### Solution of the Model

The closed-form solution to the model has been found. Scale to maximize consumer usage of time  $t$  before an abrupt halt in money supply is the government's most reliable estimate of foreign currency reserves (which may or may not occur). According to the user utility function, the  $R_t$  ideal has no impact on consumption beyond the  $t+1$  level. Consequently, the optimal currency reserve size in the  $t$  cycle maximizes the anticipated utility feature benefit in the  $t+1$  period of the demand stage.

$$R_t = \operatorname{argmax}[(1-\pi)u(C_{t+1}^b) + \pi u(C_{t+1}^d)] \quad (15)$$

Among them,  $(C_{t+1}^b)$  and  $(C_{t+1}^d)$  are defined by Equations (7) and (8) of the  $t+1$  period.

First, the predicted function has an  $R_t$  derivative of 0 to the first order, i.e.:

$$(1-\pi)(\delta+\pi)u'(C_{t+1}^b) = \pi(1-\delta-\pi)u'(C_{t+1}^d) \quad (16)$$

The cost of probability on the left side of the equation may be reduced by maintaining foreign currency reserves without completely stopping capital flow. (16). On the other hand, the right side of the equation demonstrates that there is insufficient utility as a result of the potential for a capital stop, which is further complicated by the use of foreign currency reserves in the event that a capital halt takes place. Under these circumstances, we are in a position to reliably predict how much cash ought to be stored in reserves for foreign currencies.  $P_t$  is identical to the marginal market replacement rate, often known as Mmr, under both the sudden stop and non-sudden halt scenarios.

$$r = \frac{u'(c_t^d)}{u'(c_t^b)} - \frac{(1 - \pi) \delta + \pi}{\pi (1 - \delta - \pi)} \quad (17)$$

We may also derive a new utility function  $u(C)$  by doing the following:

$$(c_t^d)^v = p(c_t^b)^v \quad (18)$$

The cost of using international reserves to solve a capital deficit is equal to the cost of repaying short-term foreign debt after accounting for the nil period premium, or the cost of maintaining long-term and short-term external debt. This means that using international reserves to address a capital shortfall has the same cost. As a direct consequence of this, there is no additional expense associated with maintaining one's holdings of foreign currency reserves. In addition, if the time premium is positive, meaning that  $p$  is greater than 1, which indicates that domestic demand would drop dramatically if there was an abrupt cessation of capital, then the market replacement rate  $p$  is equal to 1, completely subsidizing the income budget and consumption that domestic consumers would lose due to their sudden cessation of capital. The following cycle describes and resolves the optimal amount of foreign currency reserves in a clear way. It does so by expressing the size of the reserves as a constant proportion of total reserves ( $S$ ).

$$R_t = \rho Y_{t+1}^b \quad (19)$$

$R_{t-1} = Y_t$  is replaced by the 2-period customer's spending equations (9) and (10), production and short-term obligations are represented differently, and consumer budget limits are represented differently. All of these requirements are met under the 2-period conditions b and d. Also, simultaneously. By using Equation (18), we are able to arrive at the following conclusion on the ideal ratio of foreign currency reserves to export volume:

$$\frac{\rho = \lambda + \gamma}{1 + (p^{1/\sigma})^{-1}} = \frac{n^{1/\sigma} - 1}{-1)(1 - \delta - \pi)} + \frac{\frac{r}{g} - \lambda - (\delta + \pi)(\lambda + \gamma)}{1 + g} \quad (20)$$

Consequently, the formula for maximizing productivity is represented by equation (20), and it varies according to the quantity of foreign currency reserves that is sought. An analysis of seven macroeconomic indicators that have an effect on the economy as a whole may be used to determine what the optimal amount of foreign currency reserves should be for a certain nation. The market's sensitivity to risk, the time premium, the growth rate  $g$ , and the possibility of a sudden stop in capital flows all play a role in determining the optimal amount of foreign currency reserves, which is a function of output and is based on the production level. Both the ratio of short-term foreign debt to output and the fall in production that is caused by a sudden halt in capital inflows are related to the optimal level of foreign currency reserves, which is determined by a particular quantitative test. Additionally, the ratio of short-term foreign debt to output is connected to the optimal level of foreign currency reserves.

This model does not adequately take into account the impact that changes in the value of actual currencies might have on the interest rate that is earned on foreign reserves. The fluctuations in exchange rates are, in point of fact, a very significant factor that contributes to the instability of capital flows and reserves. In this hypothetical situation, the people who live in the nation would like to see an increase in the value of their currency. The nation is receiving a flood of capital with the intention of accumulating profits from exports, achieving the objective of its appreciation, and bolstering the value of the local currency. The building up of a country's stockpile of foreign reserves is often the vehicle via which fresh money is brought into the economy of that nation. If there is an abrupt pause or reversal in the flow of capital into a nation, it is possible for large sums of foreign money, particularly highly desirable currency, to leave the country in a hurry, causing the country's exchange rate to fall faster than expected. It causes oscillations in the exchange rate and intensifies the anticipated depreciation of that nation's exchange rate, which ultimately leads to a decline in the amount



of foreign reserves held by the country. In order to construct the optimal model of foreign currency reserves using the information presented in this article, it is assumed that the current exchange rate will remain unchanged. It does not imply that the exchange rate has no influence on the model of ideal currency reserves; rather, it means that the model does not take the exchange rate into consideration. At every level of the process, from establishing the criteria and variables to figuring out the specifics, we take into account how changes in the value of currencies may impact the available foreign reserves.

## THE MEASUREMENT AND SIMULATION OF THE OPTIMAL RESERVE

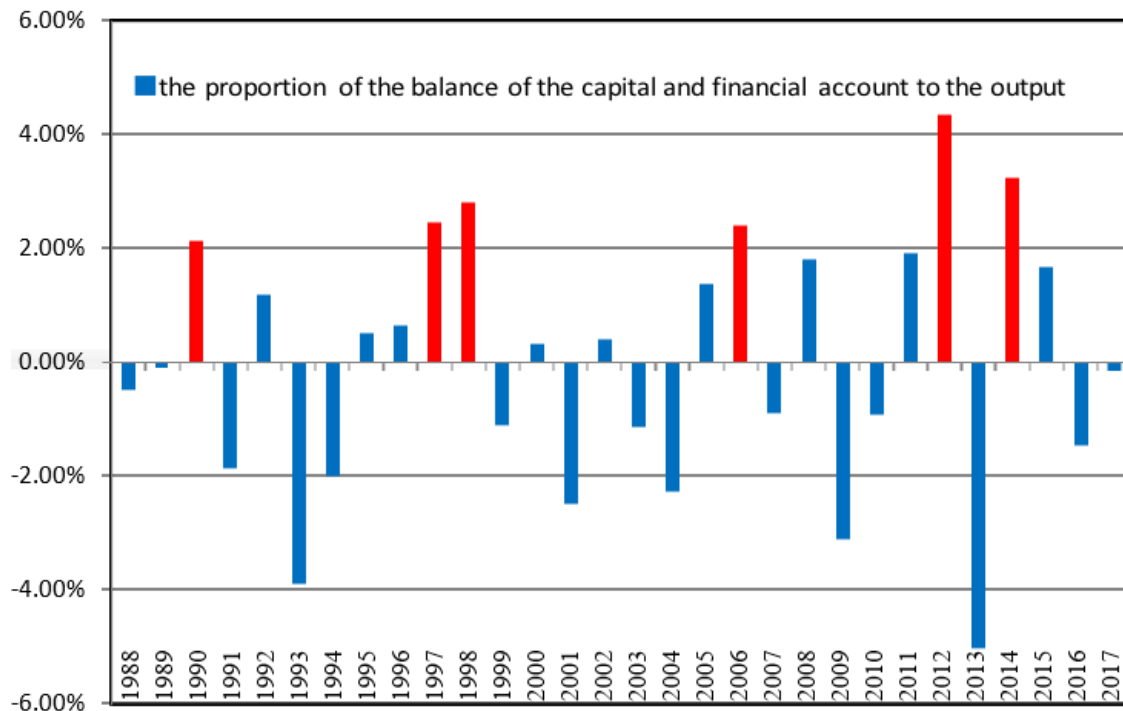
An optimal exchange reserve scale is calculated by using a formula based on the findings, and the parameters are established taking into account the present situation in Iraq. The relevant data spans the years 1994–2017, and the data selection process begins with 2017. (20).

### Setting Parameter

The likelihood of temporary detention of resources

A rapid reduction in foreign investment takes place when a nation's capital and balance of payments fall below  $t-1$  by more than 5% of its GDP, as stated by the J.R. model (Jeanne & Rancière model, 2011). If  $kt = KAt/Yt$  and  $kt-1$  is more than 5%, another factor that has to be taken into consideration is a sudden stop in the flow of money into the nation during the  $t$ -period. According to the findings of researchers Jeanne and Rancière, the average chance of the death sentence in 34 nations with levels of medium income was 10% between the years 1975 and 2003. Given the context of death punishment in Iraq, this article first counts the number of executions that occurred after Iraq's economy became more open. Because, when estimating this parameter, the relative value of for a target length of 20 years is somewhat smaller. Following is the standard deviation Mean value calculates the capital position and financial account balance as the crucial value, thus 5% preminent significance may be regarded as the mean value of capital position and financial account balance. The significance of 5% may alternatively be seen as the average significance of the value.

Figure 1. The proportion of the capital balance and financial account to the output.



Source: Prepared by authors (2023)

An Asian year in 1990, 1997, 1998, 2006, 2012, and 2015 reached 2%, which primarily explains the dramatic reduction in capital inflow that occurred during those years. Other Asian years hit 2% in 1990, 1997, 1998, 2006, and 2015. A string of five significant financial crises may be traced back to the origin of the capital and financial account deficits that occurred in 2006 (region in red of Figure 1re).

The unexpected stop in the flow of cash in 1997 and 1998 was mostly triggered by the financial crisis that occurred in Asia. In 2006, a number of countries saw a reduction in the amount of domestic capital outflows, which led to a worsening imbalance in capital and financial accounts. Evidently, it also discusses the logic behind lauding QDIIs (Qualified Domestic Institutional Investors) and other types of institutional investors and urging domestic enterprises to go outside. It is important to keep in mind that the capital and financial account deficit that was expected to occur in 2012 was the first deficit of its kind to occur since the Iraq crisis in 1998. The deficit was restored in 2015 as a result of capital flight, which was caused, among other things, by increasing interest rates in the United States (U.S.), a sinking Iraqi dinar, and other circumstances. However, this would make it more difficult for the government to use its reserves of foreign currency to offset the decline in the amount of net capital that was brought in. Therefore, the increasing frequency of financial crises in recent years, the increasing severity of contagion, the growing instability, the rising risk of significant

capital outflows, the further deterioration of Iraq's financial opening, the rising possibility of sudden detention of capital inflows, and the likely likelihood that capital inflows would be suddenly detained in the JP Morgan Chase Bank are all indicators that point to the continued deterioration of Iraq's financial opening.

#### Estimating GDP growth and the risk aversion coefficient

The GDP growth rate that was utilized in this article was computed by taking information from the website of the Ministry of Planning (<https://mop.gov.iq/en/>) and combining it with the worldwide growth rate, which was set at 9.39 percent for the period of 2004–2019.

There is just one variable that cannot be separated from the other seven, and that is the risk tolerance coefficient. However, in order to identify a solution, the most recent research and a global perspective are essential. According to research conducted by Yang Yi and Tao Yongcheng (2011), the risk aversion factor of ordinary consumers falls somewhere in the range of two to six, with a higher number suggesting a greater level of risk aversion. Utilizing data from the growing Asian market, the risk aversion coefficient in the J.R. model is first estimated, and then set, in two steps utilizing those results. The results show that the risk aversion coefficient in developing nations is often larger than it is in rich countries. (Donatelli, Proserpi, 2012). We will use a cutoff of  $\alpha=5$  to represent the usual degree of exposure held by Iraqi investors due to the fact that Iraqi investors are known to be risk-averse and cautious.

#### Calculating the time premium and the risk-free rate over the short term

The majority of Iraq's external debt is denominated in foreign government bonds, although loans denominated in foreign currency make up eighty percent of the country's total external debt. On the foreign exchange market, despite having a debt ratio that is more than 70%, the US dollar continues to be one of the most widely traded and secure currencies, which demonstrates the significance of currency structure. Recent research has demonstrated that the risk-free interest rate on short-term foreign debt is often supplemented with the short-term interest rate on U.S. federal bonds. This practice is rather prevalent. As a direct consequence of this, the London Interbank Offer Rate (LIBOR) is a more reliable indicator of how affordable Iraq's access to international loans now is. The benchmark interest rate for short-term foreign debt holdings was determined by using a three-month LIBOR weighted average

of 0.03 (StockQ database <http://www.stockq.org/economy/libor.php>) in conjunction with U.S. Treasury bill rates over the last 20 years.

The period disparity refers to the difference in interest rates that are charged on long-term vs short-term debt that is incurred in foreign countries. This is due to the fact that the interest rates on long-term notes issued by the United States government are relatively comparable to the rates on Iraq's long-term debt owed to other countries. If one is aware that the typical yield on United States Treasury notes with maturities of 10–20 years is 5%, then they are able to calculate that the period premium is 0.02%.

Calculating the combination of external debt, foreign debt, and the product failure rate

We are able to determine the ratio of short-term foreign debt to GDP for the years 1998-2017 based on the description of the short-term foreign debt ratio that is provided in the GR. The State Foreign Exchange Administration ([http://www.safe.gov.cn/zmodel\\_sarezindex.html](http://www.safe.gov.cn/zmodel_sarezindex.html)) reports that the value of on average is 6.24 percent. On the other hand, this does explain the need of foreign assets to settle temporary debt incurred abroad. The terms of the current foreign loans held by Iraq might vary from very short to very lengthy. That entails not one but two different types of compensation. When the note matures, payments are made in a single transaction. Therefore, a note having a maturity of less than one year may be considered a short-term bill. In addition, you may be able to repay your external debt that is medium- to long-term on a monthly basis, with the yearly payment being considered a short-term obligation. Both approaches are responsible for a significant portion of the demand for long-term foreign debt as well as foreign reserves. The GR model predicts, incorrectly, that the impact of short-term foreign commitments on foreign currency reserves is equal to 6.24 percent, which is a significant underestimation. The terms and conditions that have been connected to Iraq's medium- and long-term foreign debt throughout the course of the years are pertinent to this discussion. We have assumed that the average duration will be ten years, that there will be a retention rate of one hundred percent in the first year, and that there would be a one-time payment of 3.5% of GDP toward the foreign loan in the same year. After adding up the short-, medium-, and long-term quantities of debt, we get to the conclusion that the ratio of short-term foreign debt to overall debt is 8%. This is the outcome of bringing all of the debt amounts together. The harm done when there is a disruption in the intended rise in input and output is referred to as the production failure rate. The sudden stop in capital inflows as well as the sizeable outflows of foreign capital will both be included into the computation of the output loss rate for Iraq in this piece. As shown in Figure 1, during

the course of the last three decades, there have been five unique instances in which international sanctions have directly resulted in the cessation of financial inflows into Iraq. Each of these instances occurred during the 1990s. Due to the recurrence of global financial crises in recent years, there is a greater possibility of a sudden halt in the amount of money that is being brought into the country. This is true despite the fact that the amount in question is relatively small. At the same time, significant sums of cash will be traveling in many directions around the globe. On the other hand, the effect that the global financial crisis would have on Iraq's exports would be negative. Since Iraq's economic growth for such a significant portion of its history has been driven by exports, it was inevitable that the country's production would suffer as a direct consequence of the global financial crisis. According to the J.R. model, the predicted average fall in production growth rate in 34 developed nations following the capital crisis is 6.5% smaller than the reality in Iraq. These two factors are the primary contributors to this discrepancy. As a result, for the sake of this investigation, we will assume that the rate of product failure is 8.5%. In light of the study described above, the following is a condensed version of what was discovered about each metric: (Table 1). Using the information presented in Table 1, this study evaluates how well the J.R. model corresponds to the circumstances that exist in Iraq at the present time.

Table 1. Parameters, both as originally defined and as calculated.

<b>Related Variables</b>	<b>The J.R. Values as They</b>	<b>The Paper's Computed</b>
The Likelihood of an Instantaneous Rate of Economic Expansion	0.1	0.15
Coefficient of Consumer	0.066	0.94
Free-Float Interest Rate for the Time Premium $\delta$	2	5
Short-Term Foreign Debt as a Output Loss Rate $\gamma$	0.05	0.03
	0.015	0.02
	0.107	0.08
	0.065	0.085

Source: Prepared by authors (2023)

### The Optimal Reserve Solution

The research will use seven approximations to compute an estimate of the value of Iraq's Optimum Devises Assets, evaluate the appropriate quantity of foreign currency reserves, and evaluate the size of actual reserves. At the beginning of the capital flow cycle, we determine the average level of market demand and link it to the marginal consumption replacement rate P.



$$r \equiv \frac{u'(c_t^a)}{u'(c_t^b)} = \frac{(1 - \pi) \delta + \pi}{\pi (1 - \delta - \pi)} = 1.1606$$

Then, using Equation (20),  $\rho = \lambda + \gamma - \frac{p^{1/\sigma} - 1}{1 + (p^{1/\sigma} - 1)(1 - \lambda)}$   
 It can be calculated  $\rho = 13.53\%$ .  $1 - \frac{r - \lambda}{\lambda} - (\delta + \pi)(\lambda + \gamma)$ .

In the end, take the  $T$  ratio as the optimum exchange reserves and production ratio and determine the best exchange reserve scale. The conclusions are as follows. Figure 2 illustrates this point for more clarity.

As seen in Table 2 and Figure 2, Iraq's 2005 foreign exchange adjustment had a significant impact on its foreign currency reserves. With the easing of capital movement rules, Iraq's foreign currency reserves are currently the largest in the world, surpassing the \$1 trillion milestone in 2006 and continuing to grow. While it declined in 2015 and 2016, it climbed again in 2017. The currency reserves are at around \$3 trillion but are still at a very high level.

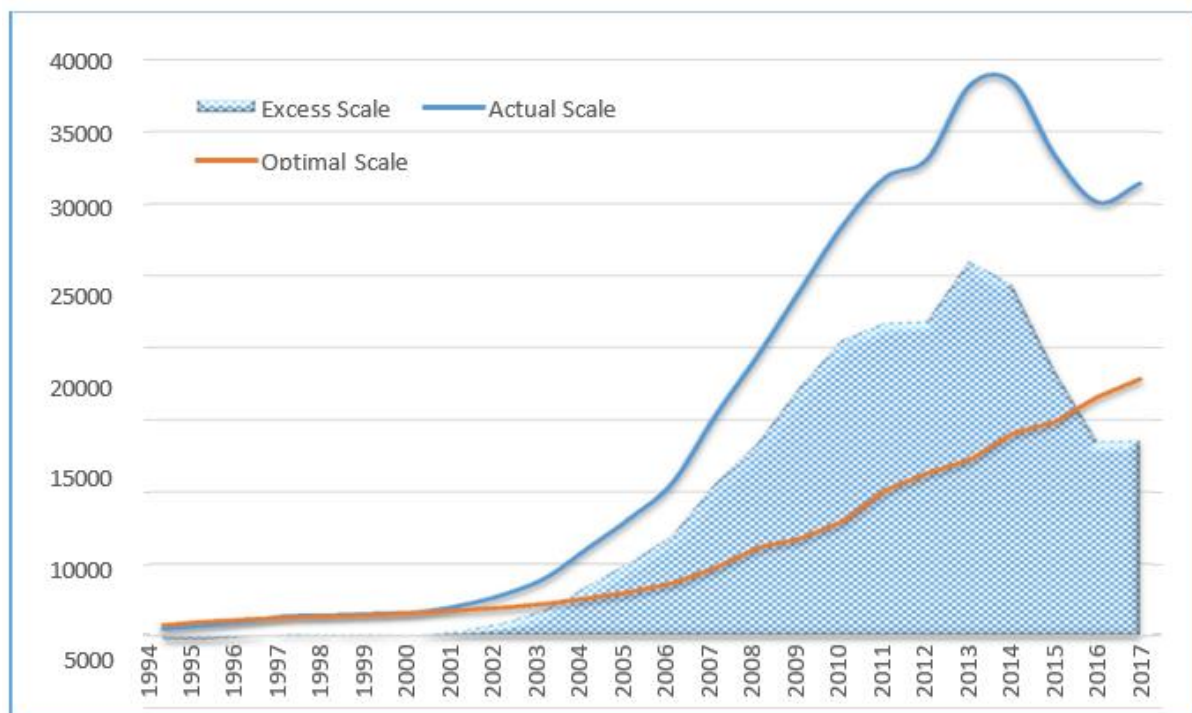
Table 2. Examining the Difference Between the Ideal and Actual Sizes of Foreign Exchange Reserves (Unit: 100 million dollars).

Year	Actual Scale	Optimal Scale	Excess Scale
1994	516.2	756.63	-240.43
1995	735.97	984.96	-248.99
1996	1050.29	1158.28	-107.99
1997	1398.90	1288.94	109.96
1998	1449.59	1379.33	70.26
1999	1546.75	1465.68	81.07
2000	1655.74	1621.54	34.20
2001	2121.65	1792.48	329.17
2002	2864.07	1967.02	897.05
2003	4032.51	2220.23	1812.28
2004	6099.32	2613.51	3485.81
2005	8188.72	3054.56	5134.16
2006	10,663.44	3671.36	6992.08
2007	15,282.49	4729.63	10,552.86
2008	19,460.30	6118.03	13,342.27
2009	23,991.52	6752.18	17,239.34
2010	28,473.38	7954.37	20,519.01
2011	31,811.48	10,111.34	21,700.14
2012	33,115.89	11,305.52	21,810.37
2013	38,213.15	12,229.31	25,983.84
2014	38,430.18	14,044.65	24,385.53
2015	33,303.62	14,859.77	18,443.85
2016	30,105.17	16,579.63	13,525.54
2017	31,399.49	17,823.86	13,575.63

Source: Prepared by authors (2023)

Second, from the perspective of the optimum exchange reserve rate, Iraq's optimal foreign reserves have increased in accordance with the precise exchange reserve scale. However, the expansion of the present currency reserve scale is fairly slow and has not been much enhanced by the short-term changes. The growth rate of Iraq's foreign currency reserves has grown despite the fact that external shocks have had a substantial impact on the optimal exchange reserve size depending on financial stability, notably following the 2008 financial crisis in the United States. Even if Iraq's foreign reserves have shrunk in recent years, the country's ideal reserve size has remained unchanged throughout that time. Furthermore, in 2015, the major Western developing economies began the rate cycle, leading to increased volatility in the RMB exchange rate, which is a leading indicator of devaluation. causing substantial outflows and growing economic strain on Iraq. The practical construction of foreign exchange reserves would increase the amount of financial security-based foreign currency reserves as financial hazards increase. The previous picture's theoretical understanding of the significance of foreign financing in ensuring a nation's economic stability is being borne out in practice.

Figure 2. The Actual Scale and Optimal Scale of Iraqi Foreign Exchange Reserves between 1994



Source: Prepared by authors (2023)

## CONCLUSIONS

On the one hand, foreign government bonds make up the bulk of Iraq's abroad holdings. The devaluation of the issuer's currency, along with the comparatively low returns of these

bonds, has had a negative impact on Iraq's currency reserve holdings. It creates a "double decline" scenario in which both the risks and potential benefits to Iraq's foreign currency reserves increase. However, the central bank's inability to control inflation due to a surplus of currency reserves has led to a passive expansion of the money supply. When a country like Iraq possesses large amounts of foreign currency reserves at a pivotal moment in history, it is up to those reserves to do all the heavy lifting of keeping the economy stable. Integrating the J.R. paradigm is what this research is all about. Correction based on maximizing utility from a financial security perspective is the basis of theoretical study. The system uses a calculation method that takes into account the social welfare function, the optimum size of exchange assets, and a three-stage model of the impact of foreign capital. Under a maximum social welfare constraint, we also proposed a closed solution for the optimum ratio of foreign currency reserves to production. The contemporary situation in Iraq, with its open economy and growing market, is a good fit for this paradigm. The open Iraqi economy operating index may be used to determine the seven basic core features, and the cost of holding foreign currency reserves can be evaluated in light of the risk aspects of Iraq's financial instability. Finally, a good estimate of Iraq's foreign reserves-to-GDP ratio may be made. This study looks at the fluctuation of Iraq's FX reserves from 1994 to 2017. Changing the size of Iraq's foreign exchange reserve occurs in phases. Iraq's foreign currency reserves have grown mostly due to the influx of interregional resources brought on by the structural distress of the dual surplus of international payments balance and long-term exchange rate appreciation. The thesis rests on the premise that Iraq's exports cannot sustain economic growth in the long run without causing a surplus in trade. The economic recovery of major Western industrialized countries, most notably the United States, at a period of rising interest rates, has been largely responsible for the depletion of foreign currency reserves since 2014.

Even more worryingly, the devaluation of the Iraqi RMB has a multiplicative effect on the volatility of the exchange rate and the flow of foreign money into and out of Iraq, both of which threaten the country's economic stability. Given the volatility of international capital flows, we must assume primary responsibility for managing currency reserves to mitigate financial risks and preserve financial stability. After a sudden halt in incoming funds, the world's attention is now squarely on a country's economic situation. There is debate about how much foreign currency reserves are required and what may be done to lessen the effect of a sudden halt in capital inflows. The analysis in this article may be seen as a first reaction. The best amount of foreign currency accounts for Iraq between 1994 and 2017 was 13.53 percent

of GDP, according to approximative factors and computer simulations. Iraq's foreign currency reserve has had a significant surplus at this percentage since 2001. On the one hand, Iraq's foreign exchange reserves will eventually lose money and unused assets due to retaining additional currency reserves and rising inflation. The considerable growth in foreign currency reserves, on the other hand, exacerbates the RMB's appreciation stresses, so harming the international competitiveness of Iraq's export goods. It demonstrates that Iraq has an abundance of foreign exchange reserves; yet, the better it is, the less reserves are accessible. An overabundance of foreign currency reserves would raise costs and pose risks for Iraq. As a result, figuring out how to regulate foreign exchange reserves scientifically is still a challenge.

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